

SYLLABUS & WEIGHTAGE OF QUESTIONS FOR ON-LINE EXAMINATION
ADVERTISEMENT No: 05/2020

MANAGER (FIRE SERVICES)

Part-A (Weightage: 50%)

General Knowledge, General Intelligence, General Aptitude, English, etc.

Part-B (Weightage: 50%)

Questions on subject relating to Educational Qualifications

S.No	Subject
1.	FIRE SCIENCE PHYSICS :- Mechanics : Newton's Law of motion, Compressive units of mass, Relative Gravity Weight, Force, Momentum, Pressure, Power, Heat :- Temperature, Temperature Scales and their Relative Calculation of specific Heat Latent Heat of vaporization, Coefficient of linear Expansion, Boyles Law, Charles Law, Critical Temperature and Pressure, Chemistry of Combustion :- Elements, Acids Base & Salts, Metals and nonmetals, Physical and Chemical Properties of metals, Gas : Physical and Chemical Properties of Different gases
2.	Basic Electricity and its Fire Hazards Fire Hazards in Generation, Distribution Station, Spark overheating, Specialized equipment used in hazardous areas, Transformer, Static Electricity etc.
3.	Design & construction of Fire Engine Design & construction of IC& CI engine
4.	Explosive & radioactive Materials and their hazards Handling of Explosives and Radioactive materials
5.	Fire Service Hydraulics Introduction and Units of measuring Length, Area, Volume, Velocity, Nozzle Discharge, Jet Reaction, Friction loss ,Break Horse Power, Pump Efficiency
6.	Planning & Construction of the buildings
7.	Structural Fire Protection
8.	Air Conditioning, Heating and Ventilating System
9.	Automatic Fire Detection & Alarm & suppression System Introduction ,Type of Detectors, Operating Principles of Heat, Smoke, Gas & Flame Detection system
10.	Fixed firefighting Installations
11.	Means of escape Action plan in case of emergency, Evacuation plan, Assembly point, Exit Sign Exit width, Travel distance, Refuse area, Means of escape and their maintenance.
12.	Fire Protection measure in aircraft hangers, Cargo, Airport Terminal Building & Warehouses Quantification of Risk, Fire prevention & protection measure at above stated occupancies.
13.	Fire Safety Legislation
14.	Disaster Management
15.	Fire Protection measure at Oil Depot
16.	Extinguishing Media Different Types of Extinguishing Media their properties used in airport Fire Service.

17.	Types of Fire-Fighting Appliances & equipment.
18.	B.A .Set & PPE Types of BA set, SCBA, Constructions, Testing, PPE, types of uses

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MANAGER (TECHNICAL)

Part-A

General Knowledge, General Intelligence,
General Aptitude, English etc.

Weightage 30%

Part-B

Questions on subjects relating to
Educational Qualifications

Weightage 70%

1. APPLIED MECHANICS AND DESIGN

- **Engineering Mechanics:** Free body diagrams and equilibrium trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations impact.
- **Strength of materials :** Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts' Euler's theory of columns; strain energy methods; thermal stresses.
- **Theory of Machines:** Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.
- **Vibrations:** Free and forced vibration of single degree of freedom systems; effect of damping, vibration isolation, resonance, critical speeds of shafts.
- **Design:** Design of static and dynamic loading; failure theories; fatigue strength and the S-N diagram: principles of design of machine elements such as bolted riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

2. FLUID MECHANICS AND THERMAL SCIENCES

- **Fluid Mechanics:** Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

- **Heat Transfer:** Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction. fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.
- **Thermodynamics:** Zeroth, First and Second Laws of thermodynamics; thermodynamic system and processes; Carnot cycle, irreversibility and availability. behavior of ideal and real gases; properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.
- **Applications:** Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat; I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air psychrometric chart, basic psychrometric process, petrol and diesel engines, automatic transmission, centrifugal pumps, application of IT in automobiles.

MANUFACTURING AND INDUSTRIAL ENGINEERING

- **Engineering Materials:** Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.
- **Metal Casting:** Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.
- **Joining:** Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.
- **Machining and Machine Tool Operations:** Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures.
- **Metrology and Inspection:** Limits, fits and tolerances, linear and angular measurements, comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.
- **Inventory Control:** Deterministic and probabilistic models; safety stock inventory control systems.
- **Maintenance Management**

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JUNIOR EXECUTIVE (AIR TRAFFIC CONTROL)

Part-A

Weightage 50%

60 questions of total 60 marks related to:

English Language (20 Marks)

- Comprehension based questions, structure of sentences, error finding, etc.

General Intelligence / Reasoning (15 Marks)

- Direction sense test, assertion and reasoning, clock, calendar test, etc.

General Aptitude / Numerical Ability (15 Marks)

- Mental visualization, spatial orientation / awareness, etc.

General Knowledge / Awareness (10 Marks)

Part-B

Weightage 50%

60 questions of total 60 marks form basics of Physics and Mathematics in concept and application:

Physics

- Electrostatics, Current Electricity, Moving Charges and Magnetism, Electro Magnetic Waves and their propagation, Optics, Electronic Devices, Laws of Motion, Scalars and Vectors, Statics and Dynamics, etc.

Mathematics

- Permutation and Combination, Probability, Three Dimensional Geometry, etc.

Duration	-	120 minutes (2 hours)
Medium	-	Hindi / English (Bilingual)

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JUNIOR EXECUTIVE (AIRPORT OPERATIONS)

Part-A

General Knowledge, General English,
Quantitative Aptitude, Reasoning (Verbal &
Non-verbal)

Weightage 50%

Part-B

Questions on subjects relating to Educational
Qualifications

Weightage 50%

Part-A

20% of part A will cover the following aviation related topics:

- Aviation related abbreviation like ICAO, BCAS, DGCA, IATA, FAA. AERA, AAI, AI, ACI, ATC, ATM, ATS, IAF, IATA.
- Knowledge of Airport Definition –Runway, Taxiway, Apron, Parking Stand, Aircraft/Aeroplane, Airport/Aerodrome
- Knowledge of Domestic and International airlines operating in India
- Basic knowledge on Airport Operations
- Basic knowledge on passenger journey from City side upto Boarding an aircraft through various processing points and related facilities in Terminal Buildings
- Basic knowledge on the functioning of Security and Airport Rescue & Fire Fighting at Airports.
- Knowledge on aircraft manufacturing companies
- Knowledge on Government Policies on aviation sectors
- Basic knowledge on Aerodynamics.
- Knowledge on ICAO, AAI, JV Airport Operators, Regulatory Organization in Aviation such as DGCA, BCAS, AERA etc.
- Basic knowledge on different categories of aircraft.
- Knowledge on the names of International/Domestic airport in India
- Knowledge on Aviation Meteorology – Fog, Mist, Haze, METAR, SPECI
- Basic knowledge on Role & function of agencies working at Airport – Immigration, Customs, Health etc.
- Any other related knowledge of Aviation

Part-B

- Questions of Physics (Class XII level) (40%)
- Maths (Class XII level) (40%)
- General Principles of Business Management (20%)

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Part-B

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Educational Qualifications

Weightage 70%

ENGINEERING MATHEMATICS

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and Eigen vectors.

Calculus: Functions of single variable, Limit, continuity and differentiability, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Cauchy's and Euler's equations, Initial and boundary value problems, Laplace transforms, Solutions of one dimensional heat and wave equations and Laplace equation.

Complex variables: Analytic functions, Cauchy's integral theorem, Taylor and Laurent series.

Probability and Statistics: Definitions of probability and sampling theorem, Conditional probability, Mean, media, mode and standard deviation, Random variables, Poisson, Normal and Binomial distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations
Integration by trapezoidal and Simpson's rule, single and multistep methods for differential equations.

APPLIED MECHANICS AND DESIGN

Engineering Mechanics: Free body diagrams and equilibrium; trusses and frames, virtual work; kinematics and dynamics of particles and of rigid bodies in place motion, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; Shear force and bending moment diagrams bending and shear stresses; deflection of beams; Torsion of circular shaft; Euler's theory of columns; strain energy methods; thermal stresses.

Theory of Machines: Displacement. Velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

Vibrations: Stress and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; *principles* of the design of machine elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

FLUID MECHANICS AND THERMAL SCIENCES

Fluid Mechanics: Fluid properties, fluid statics, manometry buoyancy; control-volume analysis of mass; momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; through pipes, head losses in pipes, bends etc.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors network analysis; heat exchanger performance, LMTD and NTU methods.

Thermodynamics: Zeroth, First and Second Laws of thermodynamics; thermodynamic system and processes; Carnot cycle, irreversibility and availability; behavior of ideal and real gases; properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

Applications: Power Engineering : Steam Tables, Rankine, Brayton cycles with regeneration and reheat; I.C. Engines : air-standard Otto, Diesel cycles. Refrigeration and air conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air psychometric chart, basic psychometric processes. Turbomachinery: Pelton-wheel, Francis and Kaplan turbines-impulse and reaction principles, velocity diagrams.

MANUFACTURING AND INDUSTRIAL ENGINEERING

Engineering Materials: Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.

Metal Casting: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.

Forming: Plastic deformation and yield criteria; fundamentals of hot and cold working processes, load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy.

Joining: Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.

Machining and Machine Tool Operations : Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures.

Metrology and Inspection: Limits, fits and tolerances, linear and angular measurements, comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools.

Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning.

Inventory Control: Deterministic and probabilistic models; safety stock inventory control systems.

Operations Research: Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.